Conference Paper

Application of Emotional Design to the Form Redesign of a Midwifery Training Aid

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Abstract

This paper focuses on the form redesign of a midwifery training aid. The training aid needed to represent a pregnant woman as well as having an appearance suitable for a medical device. The redesign was informed by Donald Norman's Emotional Design Theory in order to explore the design form to combine functionality and technology, as well to gain attention and elicit positive emotional responses from the user. The redesigned prototype was realised using 3D printing and other rapid prototyping technologies. The prototype was exhibited at an international exhibition and feedback from medical simulation experts indicated that the design form was appropriate for the intended purpose.

Keywords: Design form, Emotional Design, 3D printing, Rapid Prototyping

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1 Introduction

Training and simulation technologies provide the ability to reduce cost, increase training efficacy, and can provide opportunities for training situations which are otherwise difficult to access. This paper presents the redesign of the form of a midwifery training aid.

The first prototype, shown in Figure 1, was developed to demonstrate proof-of-concept on a lean budget. After demonstrating successful operation a separate research study was undertaken to evaluate the effectiveness of the training aid [1]. The results of the research indicate that the training aid was valuable to students' learning. Given this, a project to redesign the form and realise a more refined prototype was commissioned. The redesigned form needed to represent a woman at full term of pregnancy, as well as having an appearance suitable for a medical device. The redesign process was informed by Donald Norman's Emotional Design Theory [2] to combine functionality and technology, as well to gain attention and elicit positive emotional responses from the user.

Using the initial prototype as a starting point, and taking into consideration the feedback gained on the validation research from the end-user group (discussed above and

Figure 1: ORIGINAL MIDWIFERY TRAINING AID – PROTOTYPE1.0.

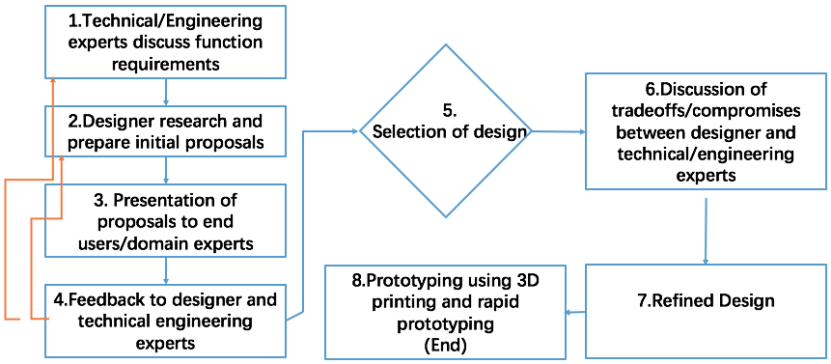

Figure 2: FLOWCHART OF THE REDESIGN OF THE MIDWIFERY TRAINING AID.

in [1]) the project team (including engineers, nursing and midwifery professionals and industrial designers) followed the below process in the redesign of the midwifery training aid. Steps 2, 4 and 7 represent steps where design occurred as influenced by emotional design.

2 Emotional Design Theory

Emotion is an important element of a person's understanding of the world and can impact on how learning and understanding occur. Donald Norman's well-known Emotional Design Theory [2] has three levels or dimensions where these three levels form a component of the user experience. These three levels are detailed below and depicted in Figure 3.

Visceral Design relates to appearance and the assumption that people generally like simple and symmetrical designs and the basic principle of visceral design is cultural commonality. Apple's [3] designs are good examples of designs which typically use simple form, and advanced grey series colour to avoid cultural differences.

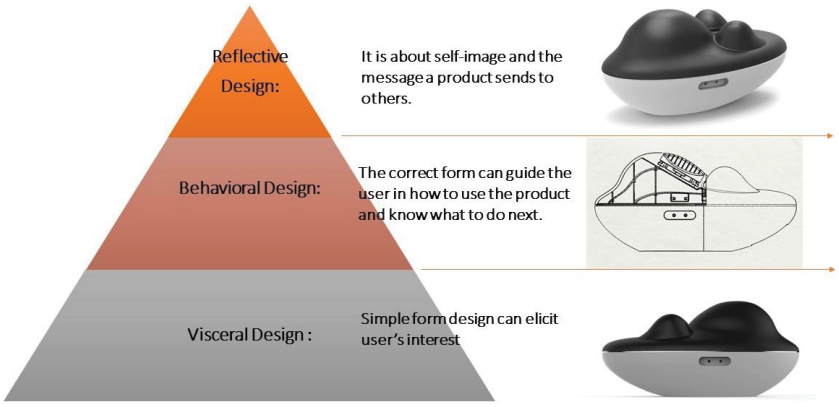

Figure 3: THE THREE LEVELS OF EMOTIONAL DESIGN AS RELEVANT TO THE REDESIGN.

Behavioural Design relates mainly to the function of the product and ensuring the design assists the user in knowing how to use the product. For the redesign of the midwifery training aid, this relates to making the use and operation of the second prototype easy to understand.

Reflective design relates to the meaning and message of a product or its purpose, and to personal satisfaction and fond memories.

3 Redesign Based on Emotional Design

Figure 2 shows the flowchart of the process undertaken in redesigning the midwifery training aid. This section focuses on the design process undertaken as part of steps 2, 4, and 7.

The redesign began by collecting information about the design of existing midwifery simulators as a basis for considering the emotion likely to be experienced by users of the device. It was observed that the form design of most of these simulators are based on simulation parameters and to represent the real-life patient in a real-world situation. Given the technologies used for manufacture and other limitations however their visual and tactile properties are far from that of a real woman. Because of this lack of real world appearance first time users might be hesitant to interact with and use these simulators.

Some products are more exciting than others, and this excitement is often desirable and something that should be strived for because it motivates customers to prefer one product over another [4]. In our project, to redesign the midwifery simulator, we made qualitative collection of user information through interviews and observations. After performing the necessary background research on existing midwifery simulators, the redesign process, informed by Emotional Design, began. Figure 4 shows how Emotion Design informed the redesign of the midwifery simulator.

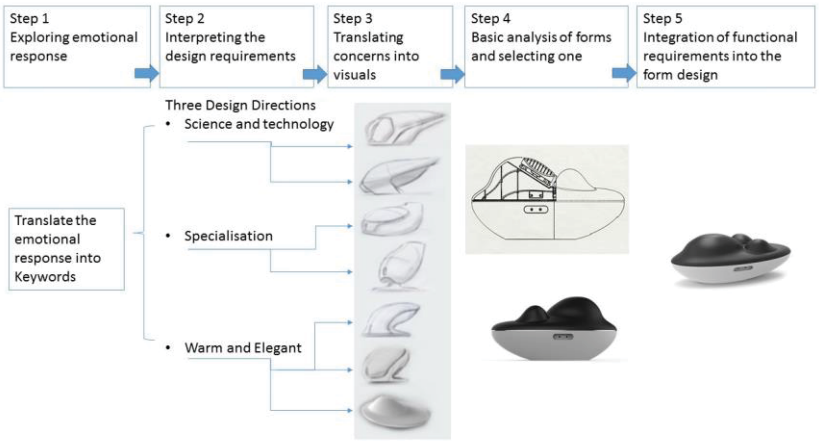

Figure 4: FLOWCHART REPRESENTING EMOTIONAL DESIGN IN THE FORM REDESIGN.

3.1 Exploring Emotional Response

A designer should consider the end users of the product during the design process. By discussing with the intended end users the designer can make sure there is the emotional fit [5]. As such, the design team sought input from all members of the project team including Engineers, Programmers, Midwives, Nurses, and 3D modellers. They were from varied countries, there was gender diversity, and everyone was involved in the observation and analysis of user's feelings. There was also input from typical end-users as part of the research study of first prototype. A key aspect of emotional design is the ability to attract attention and generate positive emotions. For this reason, the emotional design informing the redesign of the midwifery prototype considers the different levels of Norman's Emotional Design Theory.

3.2 Interpreting the Design Requirements

In order to interpret the design requirements, several keywords were used to describe the needs of the end-user.

Professional - The midwifery training aid is an important professional training aid;

Feminine - The training aid is designed to represent a woman in labour, so femininity was considered in the form design;

Science and technology/Modern - Given the high-tech nature of the training aid, and science and technology and modernity were considered;

Small - The first prototype was too bulky and difficult to transport, and to serve as a useful training aid it should support portability;

Simplicity - To support prototyping in-house and reduce cost, simplicity was an important design requirement.

Figure 5: THREE DIFFERENT DESIGN DIRECTIONS [6–8].

Based on these keywords the design team decided on exploring three design directions: *Warm and Elegant*, *Professional*, and *Technological*, as shown in Figure 5.

3.3 Realising Design Requirements

In a competitive environment the ability for a design to be distinctive is important. One way to differentiate from the appearance of other midwifery simulators is by its form. While conventional simulators attempt to follow a real-life representation of the real-world situation, this work differentiates through an abstract approach to the design of the midwifery training aid. Doing so will allow people to impress their perceptions onto the design, aligning with the Reflective level of Emotional Design theory.

3.4 Basic Form Analysis and Choosing a Design

The sketches of the proposed form were placed on a coordinate system showing the design team's perception of where they sat relative to one-another in terms of *Simplicity/Unsimplicity* and *Rationality/Sensibility*, as shown in Figure 6.

The design chosen by the design team was design F. The design has a very simple and elegant shape representing a pregnant woman without the chest represented. The design was well liked by the design team and non-domain experts.

3.5 Integration of functional requirements into the form design

Following the choice by the design team, the designs including the preference for design F were presented to midwifery and nursing experts as representative of end-users (as per step 3 of Figure 2). The feedback was that the breasts and abdomen should be consistent with a full term pregnancy. This functional requirement request extends beyond the Visceral Design level, of Emotional Design, to the Behavioural Design level. In

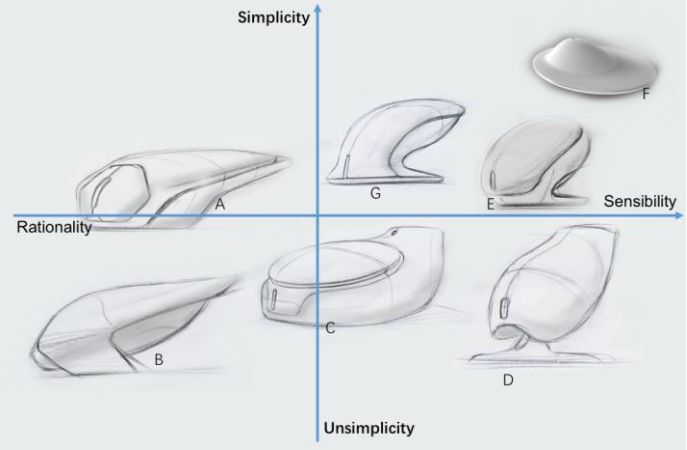

Figure 6: ANALYSIS OF THE COORDINATE SYSTEM OF THE BASIC FORMS (A-B) SCIENCE AND TECHNOLOGY STYLE, (C–D) SPECIALISATION STYLE – WHERE THE SKETCH PARTIALLY RESEMBLES A MEDICAL INSTRUMENT TO REFLECT THE FEELING OF MEDICAL EQUIPMENT, (E–G) WARM AND ELEGANT STYLE – DEFORMATION OF BEAN – WHERE THE IMPLIED MEANING RELATED TO PREGNANCY AND GROWING AND THE WHILE SHAPE IS CLOSE THAT OF THE PREGNANT STOMACH, IT ALSO PROVIDES THE REQUIRED FUNCTIONAL AREA.

a manner which can be likened to the "form follows function" principle, the functional requirement was incorporated to result in model H (as per step 5 of Figure 2) which can be seen on the upper right hand side of Figure 7. The design still retains a simple and elegant form representing femininity, but rational colours of black and white were chosen to represent science and technology.

Given the feedback on the design by representative end users, the technical requirements needed to be considered by the technical/engineering experts and compromises discussed with the design team (as per step 6 of Figure 2). Photos of the final refined design are shown in the lower part of Figure 7. The final design scheme was realised using 3D printing and other rapid prototyping technologies and is a compromise between design and functionality. The form has gentle curves, but doesn't retain the bright feminine colours instead takes rational black and white, more reflective of science and technology.

4 Conclusion

This paper discussed the redesign of the form of a midwifery training aid. The design process was informed by Emotional Design where all three levels; visceral, behavioural and reflective, influenced the design processes and decisions made. The final realised prototype has been designed to gain users' attention aligning with the visceral level of emotional design. The simple to operate and intuitive nature of the device aligns with the behavioural level of emotional design theory. Finally, the reflective level of emotional design theory informs the need for higher requirements of the form design. The prototype was exhibited at an international conference attended by medical simulation

Figure 7: DESIGN F (UPPER LEFT) AND THE EXTENSION TO REALISE DESIGN H (UPPER RIGHT), PHOTOS OF THE REALISED PHYSICAL PROTOTYPE (LOWER).

experts and feedback indicated that the design form was appropriate for the intended purpose.

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